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ABSTRACT

In order to develop relevant teacher education programs which will satisfy the demands for accountability, competencies necessary to perform effectively in contemporary school setting need to be identified and validated. A listing of selected competencies, identified for vocational and applied arts teacher education, was examined. Sixty-one practicing industrial education teachers were interviewed to determine if the listing of teaching competencies was valid. The general conclusion was that the teaching competencies identified for vocational and applied arts teachers were valid for industrial education. (Author)

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"A VALIDATION OF SELECTED TEACHING COMPETENCIES FOR INDUSTRIAL TEACHER EDUCATION"

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Statement of the Problem

"To think about the future, even the immediate future, is dangerous, but not to do so will be disastrous." This quote reflects the demanding need for change in teacher education. The need for teacher certification reform, the demands for accountability, and the need for preparing teachers in field oriented programs of teacher education necessitates the development of curricula that will prepare competent personnel for the schools of tomorrow. In attempting to develop programs that will prepare competent teachers, traditional programs will not suffice.

While preparation programs for professional school personnel have traditionally been credit-course-degree oriented, teacher educators have always recognized that teaching performance is the ultimate measure of their success. In order to develop a performance oriented program of industrial teacher education, competencies that describe effective teachers need to be identified and validated.

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This study was concerned with the validation of selected teaching competencies, identified for vocational and applied arts teacher education, for industrial teacher education. A base for industrial teacher education programs can be established by developing teaching competencies needed by industrial education teachers in modern educational facilities.

Publications dealing with competency-based teacher education are becoming more and more available. However, literature dealing with competencies needed by industrial education teachers is limited.

Competency Definition and a Model for Competency-Based Programs

Currently, competencies are utilized in the development of programs which describe the capabilities of individuals who exit from these programs. Houston describes the structure of a competency as follows:

> Teacher competencies are stated at a subgoal level; that is, they include a behavioral statement but not the criteria for successful demonstration of the competence nor the conditions under which it is to be demonstrated.[1]

Competencies are also more generic in terms of the actual behavior than are performance objectives. That is, the competency may require that several performance objectives be attained prior to the attainment of the actual competence. This fact may be due to the types of action verbs employed in the statement of the competency, as well as the deletion of the conditions and criteria.

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[1]W. Robert Houston, Strategies and Resources for Developing a Competency-Based Teacher Education Program (New York: New York State Department, 1972), p.34

Houston suggests the following 10 stage model which explains the evolvement of a competency-based education program.

1. Specify Programmatic Assumptions. Upon what assumptions or postulates is the program being designed? We assume many things about learning, about teaching, about society, about schools and education, about pupils, and about training of educators. In this first step, these are made explicit. In addition, real or potential constratints are identified so they can be worked with and eliminated if they impair program effectiveness.

2. Identify Competencies. Basic and optional competencies are specified. One or more scientific approaches are used in this process.

3. Delineate Objectives. Competencies are expanded and made more specific as they are defined as observable and explicit objectives.

4. Indicate Criteria-Levels and Assessment Modes for Objectives. In this stage, designers indicate the acceptable levels of performance and the modes through which they will be assessed.

5. Cluster and Order Objectives for Instructing. The first four stages are logically ordered, but this is not necessarily the most appropriate sequence for instruction. In this stage, designers reorder objectives so that a developmental sequence leads to greater and greater competence as a teacher.

6. Design Instructional Strategies or Modules. Only after objectives are clearly delineated and evident does the designer stipulate instructional strategies for achieving them.

7. Organize a Management System. This includes identifying the roles and responsibilities of the various institutions and individuals involved in the training program. We assume that universities, schools, and professional organizations are involved in the training process. Institutional interrelationships should be clarified early in the process so that all are represented in the development of the total design. But as the instructional strategies

are stipulated, program designers will need to organize for field experiences, module delivery, student interaction, evaluation, micro-teaching, and a multitude of other programmatic needs.

8. Prototype Test Instructional System. This is typically done with either a small group of students who engage in a total PBE experience or larger numbers participating in course-oriented intermediate program aspects. It provides a trial for the program prior to broader implementation.

9. Evaluate Instructional Program. Evaluation includes at least four aspects: (1) To what extent are objectives relevant to the educational role being trained for, (2) To what extent are criteria levels and assessment modes appropriate, (3) To what extent do instructional strategies facilitate learner achievement of objectives, and (4) To what extent do organization and management practices facilitate objective achievement?

10. Refine Program. This includes modifying objectives as well as changing the instructional strategies and program organization and management ot make them more useful. Continual refinement of every aspect of the program is characteristic of the systemic approach which undergrids most competency-based programs. This occurs not only after the initial prototype test but during each subsequent cycle of the implementation process. Programs are never completely developed; they are always in the process of change based on feedback from previous experience.[1]

The model suggests that each competency would be further delineated by specific performance objectives. Each specific competency would generate one or more performance objectives, enabling the student to demonstrate a competency by the completion of the objective.

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[1]W. Robert Houston, Designing Instructional Systems for Performance-Based Education Programs (Washington, D.C.: American Association of Colleges for Teacher Education, Committee on PBTE, 1972), pp. 9-10.

In the development of a competency-based program based upon this model, it is possible that many competencies could be generated across several disciplines. The performance elements that are unique to the discipline would be attained in the performance objectives clustered around each competency.

The literature was examined to investigate what had been written on the subject of teaching competencies identified for industrial education teachers, and to investigate relationships between competencies and competency-based programs. The Walsh study and the research done by Silvius emerges as being the major efforts on this topic. Although the competencies identified and the activities Silvius identified meet the criteria of a competency as suggested by Houston, these efforts were not directed toward developing a competency-based program.

Competencies are utilized in the development of programs which prepare teachers by the demonstration of specified competencies. Several institutions of teacher education and state departments of education are utilizing competency-based concepts.

The major effort in the identification of competencies proved to be the work of Cotrell and his staff. This group, through extensive research, developed a listing of teaching competencies for teachers of vocation education. The idea of teaching competencies across disciplines seems to be the

current topic of debate in this matter. Several examples of institutions utilizing an interdisciplinary approach were cited. The Cotrell research is in support of this concept.

This study was concerned with the following hypothesis:

Hypothesis I

There is no significant difference in teaching competencies ranked important by industrial education teachers in their fourth year of teaching and industrial education teachers in their second year of teaching.

Hypothesis II

There is no significant difference in the degree of utilization of teaching competencies by industrial education teachers in their fourth year of teaching and industrial education teachers in their second year of teaching.

Hypothesis III

There is no significant difference in teaching competencies ranked important by industrial education teachers whose programs are vocational in nature and industrial education teachers whose programs are exploratory in nature.

To meet the objectives of this study, date required for each industrial education teacher participating in this study included: a ranking of the listing of 75 teaching competencies by level of agreement; an indication of the degree of utilization of the teaching competency; number of years of teaching experience; whether the program

was vocational in nature, exploratory in nature, or both vocational and exploratory; and personal variables utilized to develop a profile of each group of participating teachers.

Sample Population Selection

The source of data for this study was from practicing industrial education teachers in grades 10-12 in Wayne, Oakland, and Macomb Counties, Michigan.

The following procedures were developed for conducting this study:

1. Two groups of practicing industrial education teachers were selected to participate in this study, a group of industrial education teachers in their second year of teaching in grades 10-12, and a group of industrial education teachers in their fourth year of teaching in grades 10-12. The reason for the selection of these two particular groups was that industrial education teachers in their second year of teaching had recently graduated from pre-service teacher education programs and their opinions would be valid. They had been in the teaching profession for only a year and could react to the listing of 75 teaching competencies from the viewpoint of teaching competencies included, or not included, in their professional education, as compared to the competencies required of them as teachers.

2. The group of industrial education teachers in their fourth year of teaching had been in the public schools for three years and had completed requirements for tenure. However, it was thought that this group could react with more sophistication to the listing of 75 teaching competencies than the industrial education teachers who had been in the profession for more than three years because, for the most part, this group of teachers should not have forgotten the components of their pre-service preparation.
3. The practicing industrial education teachers were selected from secondary schools in Wayne, Oakland, and Macomb Counties, Michgan so that each participant coule be interviewed in person.

The Interview Instrument

The data gathering interview instrument used in this study was an outgrowth of an instrument developed by Fred S. Cook in a research seminar at Wayne State University. The final instrument was developed to fulfill the objectives of this study.

The interview instrument was divided into 4 sections:

1. Personal Data. These data were collected for the purpose of developing a profile for each group of participating industrial education teachers.

2. A Script. A script was developed to insure the reliability of each interview. Provision was made in the script to define the term "competency" for each interviewee, and to help identify any teaching competencies unique to the preparation of industrial education teachers.
3. Rating Scales. Two separate scales were developed. A rating of each teaching competency by level of agreement was performed, along with the degree of utilization of the teaching competency.
4. Open-Ended Questions. Two open-ended questions were included to determine if any teaching competencies were still considered to be unique to the preparation of industrial education teachers and to identify any additional teaching competencies not included in the listing.

The question writing procedure, and the actual construction of the interview instrument were based on the procedured outlined by Kerlinger.[1]

The final interview instrument was field tested by selecting 10 per cent of the total population for initial interviews. Based upon the input from this group, the interview instrument was subsequently revised prior to

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[1]Fred N. Kerlinger, Foundations of Behavioral Research (New York: Holt, Rinehart and Winston, 1964), pp. 467-76.

beginning the data gathering process. (The industrial education teachers selected for the pilot test were interviewed again after the interview instrument was revised.) The careful design and field testing resulted in the development of procedures necessary for the accurate collection of data.

Reliability of the Interview Process

In order to obtain accurate data essential to this study, measures were taken to insure the reliability of each interview. The following procedures were employed to insure reliability.

1. Interviewers were trained by the writer.
2. Interviewers interviewed the writer to insure proper communication.
3. Recordings of interviews were randomly sampled to insure that proper interview procedures were followed.
4. Whenever possible, the interviewees were interviewed in the school setting.
5. The script was followed during each interview.

Methods Used to Record Data for Analysis

All interview instruments were edited and converted to numerical codes and punched on 80-column cards. Three cards were used to record data from each interview instrument. The first card was used to record personal variables involved in the study. The second card was used to record data obtained on the level of agreement with each of the 75

teaching competencies. The third card was used to record data on the degree of utilization of each of the 75 teaching competencies. All cards were appropriately coded for identification. All of the data in the punch card format were run through a computer and a permanent file was created.

Statistical Procedure

Data collected were concerned with teaching competencies utilized by industrial education teachers of grades 10-12 in Wayne, Oakland, and Macomb Counties, Michigan.

The responses of the two groups of participating industrial education teachers were analyzed by a t-test for independent groups. Data obtained on the level of agreement with each of the 75 teaching competencies and the degree of utilization of each of the 75 teaching competencies were subjected to a t-test for independent groups by category.

The three groups of participating industrial education teachers who described their respective programs as vocational, exploratory, or both were analyzed. This analysis took the form of analysis of variance. All hypotheses were tested at the .05 level for significance.

The profiles of participating industrial education teachers were developed by finding the mean value for each of the personal variables. The computer package used in all cases was the CONSTAT Statistical Package at the Wayne State University Computing Center.

Personal Profiles

Personal data collected on each of the participating industrial education teachers were used to develop a profile for each group of teachers involved in the study. The personal profile was determined by averaging the personal data collected from the interview instruments.

Level of Agreement With the 75 Teaching Competencies

In order to test the hypothesis that there was no significant difference in the 75 teaching competencies ranked important by industrial education teachers in their fourth year of teaching, and industrial education teachers in their second year of teaching, the following procedure was employed. Data obtained on each of the 75 teaching competencies for level of agreement were summed by category. The t-test for independent groups was the statistical method employed. The CONSTAT statistical package was used at the Wayne State University Computing Center.

Upon examination of the data, no significant differences existed between second and fourth year industrial education teachers on competency categories. The null hypothesis is therefore accepted. Both groups of participating teachers indicated nearly the same level of agreement with each category. However, the data reported did not indicate the degree of agreement or disagreement.

The following procedure was employed to determine the degree that the participants agreed with each teaching competency category. The sums on the level of agreement were determined for each participating industrial education teacher. A mean total was obtained for each competency category by group of participating teachers. The mean total was divided by the number of participants in each group, and an agreement index was reached for each category of teaching competencies. The agreement index ranged from 1 (strongly agree) to 4 (strongly disagree).

As a result of determining the level of agreement, observations could be made on the relative importance of each of the 7 teaching competency categories. Data indicated in all competency categories, aggreement was evident. The relatively high agreement indexes indicate that the listing of 75 teaching competencies was considered to be important for the preparation of preservice industrial education teachers.

Utilizing the agreement indexes, the teaching competency categories could be ranked as to their relative importance for each group of participating industrial education teachers.

The high agreement indexes indicated that the teaching competencies were considered important for pre-service industrial teacher education.

Utilizing the agreement indexes calculated for the ranking of the teaching competencies within the categories, the total list of 75 teaching competencies could be ranked.

Relationships Between Competencies Ranked Important and the Type of Program

In order to test the hypothesis that there is no significant difference in the 75 teaching competencies ranked important by industrial education teachers whose programs are vocational in nature and industrial education teachers whose programs are exploratory in nature, the following procedures were followed. Three groups were established from the total population. Group 1 was the portion of the sample whose programs were vocational in nature. (39 teachers were in this category.) Group 2 was the portion of the sample whose programs were exploratory in nature. (9 teachers were in this category.) Group 3 was the portion of the sample whose programs were both exploratory and vocational in nature. The reason for classifying the programs as both was that some of the industrial education teach two vocational classes and one exploratory class. Data obtained on level of agreement with each of the 75 teaching competencies ranked important by the 3 groups of participating industrial education teachers were summed by competency category.

Upon examination of the data the result is that there was no significant difference in teaching competencies ranked important by industrial education teachers whose programs were vocational, exploratory, or both. The null hypothesis is accepted.

Perhaps data collected from larger groups would yield different results. Also, the fact that only the high school teachers were invited to participate in this study and not junior high school teachers may have effected the results.

The data reported were in support of the research done by Cotrell as reported previously. Regardless of the method of grouping the sample population, there was no significant differences in teaching competencies ranked important by the participants in this study.

Degree of Utilization of the 75 Teaching Competencies

Data were collected on the degree of utilization of the 75 teaching competencies by the two groups of participating industrial education teachers. The data collected were used to test the hypothesis that there is no significant difference in the degree of utilization of the 75 teaching competencies by industrial education teachers in their second year of teaching and industrial education teachers in their fourth year of teaching. In order to test the hypothesis, the data were summed for each category of teaching competencies. The t-test for independent groups was the statistical method employed. The CONSTAT statistical package was used at the Wayne State University Computing Center.

Upon examination of the data, the result was that there was no significant difference between the groups of teachers on the degree of utilization of the 75 teaching competencies. The null hypothesis is therefore accepted.

The data did not indicate any patterns in the degree of utilization of the 75 teaching competencies.

Analysis of Data From Open-Ended Questions

In almost every case, when asked to define a unique teaching competency for industrial education, the interviewee responded, "expertise in the technical discipline." Competency 62, "maintain expertise in the occupational specialty," speaks to this point. In all vocational disciplines, the teacher should demonstrate this competency. It would not matter if the discipline was Agriculture Education, Industrial Education or Business Education; the teacher should demonstrate competence in the subject matter.

As a result of interviewing 61 practicing industrial education teachers on the secondary level, the conclusion was that it was impossible to identify a teaching competency that was needed only by the industrial education teacher and not any other teacher. The conclusion was that the technical competencies are unique to the teaching area.

Conclusions and Recommendations

Conclusion 1

The listing of 75 teaching competencies for Vocational and Applied Arts Education is a valid listing of teaching competencies for industrial teacher education. This conclusion is based on the relatively high agreement indexes calculated for the teaching competencies.

Recommendation 1

Performance objectives need to be developed which allow for the mastery of the teaching competencies by prospective industrial education teachers.

Conclusion 2

Some teaching competencies are more important for the preparation of pre-service industrial education teachers than other teaching competencies. This conclusion is based on the fact that the teaching competencies were ranked by calculating the agreement indexes.

Recommendation 2

Performance objectives need to be developed which place greater emphasis on the more important teaching competencies.

Conclusion 3

Industrial education teachers, regardless of the number of years of teaching experience, can identify teaching competencies needed by the pre-service industrial education teacher. This conclusion is based upon the finding that there were no significant differences in teaching competencies ranked important by industrial education teachers in their fourth year of teaching and industrial education teachers in their second year of teaching.

Recommendation 3

Experiences for the industrial education pre-service teacher need to be identified and implemented which lead to the mastery of the teaching competencies.

Conclusion 4

Teaching competencies can be identified as being interdisciplinary. This conclusion is based on the finding no unique teaching competencies for industrial teacher education could be suggested by the industrial education teachers participating in this study.

Recommendation 4

The mastery of teaching competencies and performance objective identifies as interdisciplinary can be accomplished through interdisciplinary instruction, with the application of the competency to the prospective teacher's discipline.

Conclusion 5

Teaching competencies needed for the industrial education teacher are the same regardless of the type of program he teaches. This conclusion is based upon the finding that no significant differences existed in the level of agreement with the teaching competencies and the type of program.

Recommendation 5

Industrial teacher education programs need to be developed which allow for the mastery of the teaching competencies needed to perform effectively in industrial education classrooms and laboratories regardless of the type of program in which they are involved. Performance objectives need to be developed which allow for the application of the teaching competency to the type of program in which the prospective teacher will be involved.

Conclusion 6

Experienced industrial education teachers and industrial education teachers with less experience utilize teaching competencies to the degree that they are needed to perform as an industrial education teacher. This conclusion is based upon the finding that no significant differences existed in teaching competencies utilized by industrial education teachers in their second year of teaching and industrial education teachers in their fourth year of teaching.

Recommendation 6

Teaching competencies that teachers need to utilize should be practeced in the pre-service preparation of the industrial education teacher. These teaching competencies involve not only theory but also performance. Segments of the teacher education program should be devoted to the actual performing of the teaching competency.

Suggestions for Further Research

Research is needed to identify the teaching competencies needed by the in-service industrial education teacher. This could lead to the development of competency-based programs for in-service industrial teacher education. Such competencies could be identified and validated by a process similar to the process used in this study.

In order to develop more support to the conclusion that regardless of the type of industrial education program, teaching competencies needed to be an effective industrial

education teacher are nearly identical, research on teaching competencies needed by junior high school industrial education teachers needs to be conducted.

Research is needed to develop teacher education programs which provide for the interdisciplinary instruction of teaching competencies identified as being interdisciplinary. Perhaps if the career education concept is to become a viable educational process in the public schools, teacher education programs will have to lead the way.

As teacher education programs are basically the third and fourth years of the education process, the competencies needed for the completion of the first and second years need to be identified and validated.

The industrial education teachers participating in this study placed great emphasis on the technical knowledge required by the industrial education teacher. Research is needed to identify the technical competencies of the industrial education teacher, and programs are needed to provide for the mastery of these competencies.

Selected Observations of the Writer

This section is devoted to a discussion of observations the writer made during this study. Such observations may, or may not be supported by the data collected.

Due to the fact that individual aptitudes, interests, and capabilities vary, in-service programs need to be developed

which allow the in-service teacher to diagnose and correct weaknesses in his pre-service education preparation. This could be accomplished by testing the in-service teacher on the pre-service competencies, and allowing the deficiencies to be corrected during the completion of the program needed for continuing certification.

A great deal of emphasis was placed upon the technical competencies needed by the industrial education teacher by the teachers participating in this study. In-service programs could be structured which could allow for the technical education of the teacher. As the length of teaching experience increases, the technical knowledge decreases by the fact that the teacher is not in the technical profession. Workshops need to be provided which would allow for the up-dating of the technical competence.

Programs of industrial teacher education need to become field oriented. The teachers in this study placed greatest emphasis on the teaching competencies which were utilized daily. In order to develop relevant programs of industrial teacher education, mastery of the teaching competency should be accomplished in real life situations.

The teaching competency, "use a systems model in planning and managing the learning environment," received the least support. It is the opinion of the writer that this was due to the fact that systems techniques in education are relatively new. Performance objectives need to be developed which will

give the prospective teacher competency in this area. Also, the application and the benefits derived from systemic approaches to problem solving need greater emphasis.

The interview technique is a very powerful research tool. The survey technique is often used as a substitute for the interview technique. Data that can not be gathered by surveys can very easily be gathered by interview. The interview process provides for instant feedback on data required, allowing for the more rapid collection of data.